

WHAT IS DIABETIC NEUROPATHY?

If you are a diabetic, you probably heard the term 'neuropathy' mention by one of your doctors. Peripheral neuropathy is among the most common complications of diabetes effecting up to 50% of patients. Once diabetic neuropathy occurs it almost always gets worse.

The neuropathy that occurs most commonly affects the feet first, and then the hands. You will start to notice sensory changes, such as numbness or tingling in your toes or fingers. In the beginning, these symptoms will come and go, but then will be constant. Symptoms may also include such feelings as burning, a cold feeling in the feet, even though the feet are warm to the touch or waxy or wood like feeling. These unpleasant symptoms may interfere with your going to sleep, or cause you to awaken from sleep.

Neuropathy is the leading cause of ulcerations or holes that occur in the feet. It is also the leading cause of infections in the feet as well as the leading cause of loss of toes.

The most common form of diabetic neuropathy is a change in sensation in a stocking and glove distribution. This means that for your feet, the entire foot is affected, both the top and the bottom, and all of the toes. The entire hand can also be affected, both the front and the back. The pattern of neuropathy is usually the same for both the right and left foot and right and left hand.

WHAT ARE THE SYMPTOMS OF NEUROPATHY?

The symptoms of diabetic neuropathy, of the sensorimotor polyneuropathy type, the most common type that we are discussing, are numbness and tingling, and weakness, and are essentially the same as those of nerve compression. Diabetes creates the neuropathy according to some metabolic process which then makes the nerves susceptible to nerve compression resulting in this stocking type distribution.

Tarsal tunnel syndrome in the foot is a problem similar to carpal tunnel in the hand. It involves compression of the posterior tibial nerve in the bony tunnel on the inside of the ankle. This nerve supplies the entire bottom of the foot, from toes to heel. Compression of the posterior nerve can result in numbness and tingling of the heel, arch, the ball of the foot and the bottom and tips of the toes. The loss of sensation in the feet can cause a loss of balance, a feeling of unsteadiness, and cause you to fall.

WHY SHOULD NERVES IN THE DIABETIC BE COMPRESSED?

Nerves begin in the spinal cord and extend into the fingers and toes. Along this path, there are anatomic areas of narrowing. These areas exist in everyone. Although some people may have been born with structures that would make these areas or tunnels more narrow and the nerves more likely to become

pinched, diabetics has two unique reasons to make nerves susceptible to compression.

The first reason that a diabetic's nerves are susceptible to compression is that the nerves in a diabetic are swollen. Sugar from the blood enters into the nerve to give the nerve energy. This sugar, glucose, is converted into another sugar called sorbitol. Sorbitol's chemical formula makes it attract water molecules, and so water is drawn into the nerve causing the nerve to swell. If the nerve swells in an area or tunnel that is already tight, then the nerve becomes pinched, or compressed, causing symptoms.

The second reason is related to the transport systems within the diabetic nerve itself. The nerve is filled with a substance that lets important chemical messengers move along the nerve, carrying messages that let the nerve's central part know what is happening at its other end. If the nerve becomes damaged, by compression, for example, and its cell membranes need to be rebuilt, these building proteins are transported downstream inside the cell along tracks called tubulin. This mechanism, called the slow anterograde component of axoplasmic transport, does not work normally in diabetics. This information has been known since 1979. This decrease in axoplasmic transport means that the nerve cannot repair itself well, rendering it more likely to remain in trouble from compression, and therefore produce symptoms.

WHAT TYPE OF SURGERY CAN BE DONE?

Surgery that is well known to restore sensation and strength to people with nerve compression, like carpal tunnel syndrome, can be done in patients with diabetes. The surgery opens the tight areas through which the nerve passes by releasing a ligament or fibrous band that crosses the nerve. This gives the nerve more room, allows blood to flow better in the nerve and permits the nerve to glide with movements of nearby joints.

Decompression of a peripheral nerve in a diabetic can alter the natural course or history of diabetic neuropathy by removing the tight areas along the length of the nerve that causes the compression like symptoms.

The surgery to decompress the nerve does not change the basic, underlying metabolic (diabetic) neuropathy that made the nerve susceptible to compression in the first place. When the surgical decompression is done early in the course of nerve compression, restoration of blood flow to the nerve will stop the numbness and tingling, and permit strength to recover. When the decompression is done later in the course of nerve compression, and the nerve fibers have begun to die, decompression of the nerve will permit the nerve to regenerate.

If you wait too long to decompress the nerve, recovery may not be possible. If you already have ulcerations on your feet, or have lost toes, then very little

sensation may be recovered because the damage to the nerve has become irreversible.

The ideal candidate for surgery is the diabetic who is beginning to experience numbness and tingling in the feet. This patient should be tested in order to measure the degree of sensory loss. We perform a painless neurosensory test in our office with a pressure-specified sensory device. This is done with a computer and does not hurt because there are no needles or electric shocks. The test takes about an hour and needs to be done before surgery to assess the loss of sensation. Diabetics should have neurosensory testing every year.

IS THE SURGERY SUCCESSFUL?

The studies that have been done over the past fifteen years indicate that overall about 80% of those diabetics who have had a nerve decompression have had decreased pain, improved sensory and motor function, and an improvement in their balance.

Patients usually seek attention sooner when it is their hands that bother them and will therefore have better success in restoring sensation and motor function to the hand. Patients tend to wait longer for treatment when their feet are involved and the neuropathy is more advanced. In one recent study 88% of upper extremity nerves' sensory function were improved by surgery. For the lower extremity, the degree of sensory loss in the feet was worse than it was for the hands. Still, 69% of nerves decompressed in the lower extremity resulted in improved sensation. While these results in no way guarantee that **you** will achieve an excellent outcome, they are suggestive of what can be achieved by this approach.

